“A COMPARATIVE STUDY ON THE EFFECTS OF STAIR CLIMBING EXERCISE VERSUS STATIC CYCLING ON CARDIO RESPIRATORY RESPONSE AMONG HOUSE MANAGERS”

A Dissertation Submitted to

THE TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY

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In partial fulfilment of the requirements

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Submitted by

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Prof.K.RAMA DEVI, M.P.T (Cardio-Resp)

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Dissertation Evaluated on _____

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CERTIFICATE II

This is to certify that the dissertation entitiled **"A COMPARATIVE STUDY ON THE EFFECTS OF STAIR CLIMBING EXERCISE VERSUS STATIC CYCLING ON CARDIO RESPIRATORY RESPONSE AMONG HOUSE MANAGERS"**was carried out by Reg.No. **271430209** PPG College of Physiotherapy,Coimbatore-641035 in partial fulfillment for the award of degree in Master of Physiotherapy as per the doctrines of requirements for the degree from **THE TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY, CHENNAI-32.** Under my guidance and direct supervision.

DATE:

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Guide

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CHAPTER I

INTRODUCTION

A physically active lifestyle is well established as a central component in the maintenance of good health and disease prevention. The majority of adults in our society appear reluctant to undertake even the minimum exercise recommendation to achieve discernible health benefits. The prevalence of sedentary behavior is greater than that of cigarette smoking, hypercholesterolemia, or hypertension. Consequently, it has been postulated that the overall impact of stimulating our society to engage in a more active lifestyle could effectively lower coronary heart disease (CHD) rates, to a greater extent than by altering any other single risk factor.[1] According to recent WHO report, globally around 23% of adults aged 18 and above (Men 20% and women 27%) is not active enough.[2]

This suggest that majority of the society may have very low level of fitness proportionately with age. It is a common misconception among house managers that doing household work is a physical activity similar to exercise, but any form of physical activity must follow the FITT (Frequency/ Intensity / Time / Type) principles to be called as an exercise. Apart from this misconception there are few other factors that prevent house managers from doing exercise as, self-contended in physical activity, lack of time availability and lack of knowledge in simple economical exercise methods.

Assessing cardiorespiratory fitness or aerobic capacity, is one of the most important components of fitness.[3] Generally testing for cardio respiratory fitness can be costly, time consuming and also the tests requires elaborate equipment. The YMCA **step test for cardiovascular fitness** is one of the simple assessment for cardiorespiratory responses. This can be easily completed at home and a cost effective method and measures **aerobic (cardiovascular) fitness level** based on how quickly heart rate returns to normal after exercise.[4]

Generally aerobics seems to be the best way of achieving physical fitness without many complications. Selecting a suitable exercise program always remains a challenge and is an area of much debate. Various studies indicate that Stair Climbing and Static cycling exercise helps to improve on the Cardio respiratory fitness.

Stair climbing provides a ubiquitous and cost-effective opportunity to incorporate physical exercise into the daily routine. Stair climbing has been shown to enhance muscle recruitment and improve cardiovascular capacity.[5] Stair climbing, burns roughly a calorie for every 10 upward steps and every stair descended, burns 1 calorie for every 20 steps.[6]

It is documented that regular aerobic exercise of riding a stationary cycle can strengthen heart, lungs and improve body's ability to utilize oxygen. Consistent use of a stationary cycle can help decrease blood pressure and heart rate and improve respiratory function. For the best results, the American Heart Association recommends exercising five times per week for 30 minutes each day.[5]

Though these methods of training seem to be effective in altering the fitness levels, it has not been done with Indian house managers and the dominancy of one exercise over other is not established well. This study will review the difference between the effects of stair climbing and static cycling in cardio respiratory responses in house managers.

1.1 BACK GROUND OF THE STUDY

It is observed that the cardio respiratory responses of the house managers are poor due to sedentary life style and lack of physical workouts. This study is conducted to assess the effect of the stair climbing exercises versus static cycling exercises on the cardio respiratory response (heart rate) in sedentary house managers who scored below average scores in step test.

1.2 NEED OF THE STUDY

Prolonged time of sedentary lifestyle significantly increases the risk of chronic diseases and reduces the cardio respiratory fitness.

This study helps to better understand the physiological responses to aerobic exercises and allow the therapist to be more knowledgeable when they prescribe these forms of exercises among the specified study population.

Many studies have been performed to evaluate the cardiorespiratory responses to aerobic exercises like stair climbing exercise and static cycling exercise but the comparison of the study is minimal.

Such study is intended to provide guidance for better evaluation and intervention to improve cardiac fitness. Hence this study is conducted to examine and compare the cardio respiratory response (heart rate) respect to stair climbing exercises versus static cycling in sedentary house manages who scored below average scores in YMCAstep test.

1.3 AIM OF THE STUDY

To compare the effectiveness of stair climbing exercises and static cycling exercises on improving cardiorespiratory responses in sedentary house managers.

1.4 OBJECTIVES OF THE STUDY

1) To evaluate the effect of stair climbing exercises on cardiorespiratory responses in sedentary house managers.
2) To evaluate the effect of static cycling exercises on cardiorespiratory responses in sedentary house managers.
3) To compare the effect of stair climbing exercises and static cycling exercises on cardiorespiratory responses in sedentary house managers.

1.5 HYPOTHESIS

Null hypothesis

There will be no significant difference between stair climbing exercises and static cycling exercises on cardiorespiratory responses in sedentary house managers.

Alternate hypothesis

There will be significant difference between stair climbing exercises and static cycling exercises on cardiorespiratory responses in sedentary house managers.

1.6 OPERATIONAL DEFINITIONS

Step test:

Test of aerobic fitness involving stepping up and down with alternate legs for a predetermined period followed by a series of measurements of post exercise heart rate, to determine its rate of return to resting level.

Ref: Arthur M.Master,American heart journal,2002

Aerobic Exercise:

Exercise performance of physical exertion for improvement of health or correction of physical deformity. Active exercise motion imparted to a part by voluntary contraction and relaxation of its controlling muscles. Active assistive exercise voluntary contraction of muscles controlling a part, assisted by a therapist or by some other means. Aerobic exercise a type of physical activity that increases the heart rate and promotes increased use of oxygen in order to improve the overall body condition

Ref: Leslie H Willis, Journal of applied physiology, 2005

Stair climbing:

Stair climbing is the climbing of a flight of stairs. It is often described as a "low-impact" exercise **.**

Ref: Boreham CA, Wallace WF, British journal of sports medicine 2000

Static cycling:

A stationary bicycle (also known as exercise bicycle, exercise bike, or exercycle) is a device with saddle, pedals, and some form of handlebars arranged as on a bicycle, but used as exercise equipment rather than transportation.

Ref: Gyeong Hee cho Journal of physical therapy sciences 2007

Heart rate:

Heart rate is the speed of the heartbeat measured by the number of contractions of the heart per unit of time, typically beats per minute (bpm).

Ref: Nicholas A Boon Principles and practice

House managers

They are married woman who manages the household as her main occupation and whose spouse usually earns the family income.

Ref:Paul Kasriei,Journal of general Management,2009

CHAPTER II

REVIEW OF LITERATURE

Sedentary lifestyle

Thomas E Vanhecke MD et al (2009) stated that sedentary lifestyles and poor physical fitness are major contributors to the current obesity and cardiovascular diseases[7].

Tikkanen et al (2013) findings suggest that not only the lack of physical activity, but also prolonged times of sedentary behaviour has resulted in inactive locomotor muscles and significantly increase the risk of chronic diseases[8].

Lewis AL and Eves FF (2011) found that the specificity of the effect confirms the appeal of this lifestyle activity for the overweight[9].

Aerobic exercise

Tam ND (2013) stated that after less than 30 min of aerobic exercise there is a significant increase in cardiovascular activity and speed when compared with Non exercise group.[10]

Nsenga AL, Shephard RJ and Ahmaidi S (2013) observed that the children with cerebral palsy who engaged in aerobic training improved their peak oxygen consumption, heart rate and ventilation significantly. In conclusion, children with cerebral palsy can benefit significantly from cardio-respiratory training (aerobic training) and should be included in rehabilitation programs.[11]

Steven Mann (2013) confirmed after study that physical activity, aerobic exercises helps in the prevention and management of dyslipidemia while reducing the risks of heart attacks, strokes and coronary artery disease.[12]

Jonathan Myers, PhD et al (2015) found that physical activity and physical fitness and levels of Cardio Respiratory Fitness are associated with better health outcomes. [13]

Strasser B et al (2011) found that a combination of strength and endurance training resulted in considerable improvements in Rheumatoid Arthritis patients' muscle strength and cardio-respiratory endurance, accompanied by positive changes in body composition and functional ability.[14]

Step Test

Knight E et al (2014) stated that STEP is an evidence-based cardiorespiratory fitness assessment and exercise prescription tool appropriate for use by various health professionals in clinical practice. The prediction equation for VO_2max from the STEP tool is valid for use with adults 18 to 85 years of age.[15]

Bronner S and Rakov S (2014) stated that the YMCA step test, correlations between Heart Rate peak and Heart Rate recovery were high (r = 0.85), and correlations between Heart Rate peak and fitness category were very high (r = 0.98). It also concluded that the step test provides an efficient, acceptable tool for testing dance populations.[16]

Beutner et al (2015) found that in the YMCA Step test, including the 1-minute heart beat count", predicted VO2peak with $R = 0.83$. It stated that models based on heart rate measures were only valid in subjects who completed the test according to protocol, but not in subjects who terminated prematurely.[17]

Teren A et al (2015) evaluated the YMCA-step test for the estimation of cardiorespiratory fitness in the general population and found that among the eighty-six subjects who completed the step test according to the protocol the correlations of VO_{2_PEAK}, heartbeat count and VO_{2_STEP} were 0.67, 0.63 and 0.49, respectively[18].

Stair climbing

Lewis G. Halsey (2012) reported that stair climbing has been shown to enhance muscle recruitment and improve cardiovascular capacity.[19]

Boreham CA et al (2000) confirmed in his study that accumulating short bout of stair climbing activity throughout the day can favourably alter important cardiovascular risk factors in previously sedentary young women. [20]

Tam ND (2013) stated that Stair-climbing exercise is used to increase the cardiovascular output of human subjects.[21]

Teh KC and Aziz AR (2002) stated that Stair-climbing exercise using a local public-access staircase met the minimum requirements for cardiorespiratory benefits and can therefore be considered a viable exercise for most people and suitable for promotion of physical activity.[22]

Donath L et al (2014) stated that stair-climbing significantly improved resting and exercise heart rates, perceived exertion, and dynamic balance performance in healthy seniors and may contribute to better overall fitness, reduced fall risk, and less perceived strain during daily life activities.[23]

Static cycling

Ozaki H et al (2015) found that Cycle training induces muscle hypertrophy similarly between young and older age groups.[24]

Gillen JB et al (2014) reported that 3 min of all-out exercise performed within a 30 min time commitment per week including warm-up and cool-down, improved skeletal muscle oxidative capacity and indices of cardio-metabolic health including VO_2 peak and blood pressure, in overweight/obese adults.[25]

Sidhu SK et al (2015) stated that during sustained cycling implies an increase in the excitability of the intracortical inhibitory interneurons during the exercise and changes in the responsiveness of intracortical inhibitory interneurons are similar during locomotor exercise and static single joint contractions.[26]

Strasser B et al (2011) found that a systematic endurance training on a cycle ergometer two times per week, resulted in considerable improvements in RA patients' muscle strength and cardio-respiratory endurance. This was accompanied by positive changes in body composition and functional ability.[27]

CHAPTER III

METHODOLOGY

3.1 STUDY DESIGN:

Comparative study

3.2 STUDY SETTING:

The study was conducted in the gym and the public access stairs of residential apartments.

3.3 POPULATION OF STUDY

House managers of age group of 36 to 45 years.

3.4 SAMPLE SIZE

40 house managers with sedentary life style.

3.5 STUDY SAMPLING TECHNIQUE

Simple Random Sampling.

3.6 STUDY DURATION

The duration of study was 6 weeks.

3.7 SELECTION CRITERIA:

Inclusion Criteria:

- Sedentary life style house managers
- Age group 36-45 years
- Step test Score of less than below average (115-120 beats per minute).

Exclusion Criteria:

- History of cardio respiratory diseases
- Muscular skeletal injury
- Working women
- On regular exercise
- Any systemic illness that may affect the study.

3.8 MATERIAL

- Stop watch
- 12 inch step
- Stethoscope
- Sphygmomanometer
- Static Cycle
- Metronome
- Consent form
- Data collection sheet

3.9 PROCEDURE

The subjects meeting the inclusion / exclusion criteria were included in the study. The subjects were explained in detail about the procedure and the consent form is signed by the subject itself. All the 40 subjects were pre and post tested with YMCA step test to find out the cardiorespiratory fitness level. The subjects were divided into two equal groups, group A (Stair Climbing) and group B (static cycling). Each group contains 20 subjects. A general warm up and cool down exercise was taught and practiced each day of training. The duration of training is of 6 weeks. Subjects were instructed not to participate in any other exercise program during the training period. The data collected is documented and statistically analyzed.

3.10 TECHNIQUE

Step test:

The YMCA 3-minute Step Test [4.] is adapted to the study; it is based on how quickly the heart rate recovers following a short bout of exercise.

1. The metronome was set to 96 beats per minute and made audible to the subjects.

2. After warm up the subjects were made to stand facing the step.

3. The subjects begin stepping on and off the step to the metronome beat following a cadence of up, up, down, down along with the timer monitoring

4. Test is continued for 3 minutes. Terminated if the subject is not able to continue for any reasons or observed stressed by the assesse

5. After 3 minutes, the subjects were made to sit immediately and manual pulse reading was made for an entire 60 seconds

6. The documentation was made and the score was located from the rating scale and marked as pretest score.

Group A

Group A participants were subjected to Stair climbing exercises 5 days / week, with warm up and cool down. Subjects allocated to the exercise group embarked on a six week progressive stair climbing program. The program began with two bouts of stair climbing five days a week in weeks 1 and 2, increasing by one climb a day in the next two weeks and increasing by 5 climb a day in 5^{th} and 6^{th} week. By the last two weeks (5 and 6) of the study, all subjects were completing five bouts of stair climbing five days a week. [20]

Week (5 training days)	Number of bouts (1 bout = 18 steps)
1	2
2	2
3	2+1 step /day
4	+ 1 Step /day
5	+ 5 steps/day
6	+ 5 steps/day

Training logs were maintained by the assesse on daily training.

Group B

The exercise training was supervised and consisted of 3 days / week for 6 weeks. All training sessions included a 2 minutes warm-up to start with and each session consisted of 3×20

seconds all-out cycling efforts, separated by 2 minutes of low intensity cycling followed by 3 minutes cool-down at the end, for a total time commitment of 10 minutes. The weekly training protocol therefore involved a total of 3 minutes of very intense intermittent exercise within a time commitment of 30 min including warm-up, cool-down and the recovery between efforts. Heart rate was monitored at each session. [25]

Time duration	**Work out**
2 min.	Warm up
3*20 sec.	High intensity
3* 2 min.	Low intensity
3 min	Cool down

3.11 STATISTICAL TOOL

The statistical tools used in the study were paired "t" test and unpaired "t" test.

Paired't' test:

The paired "t" test was used to find out the statistical significance between pre and post-test of sedentary male volunteers treated with diaphragmatic breathing exercise and upper body resistance training exercise.

Formula: Paired "t" test:

$$s = \sqrt{\frac{\sum d^2 - \frac{(\sum d)^2}{n}}{n-1}}$$

$$t = \frac{\bar{d}\sqrt{n}}{s}$$

d = difference between pre test Vs post test values

d = mean difference

n = total number of subjects

s = standard deviation

Unpaired "t" test:

`The unpaired "t" test was used to compare the statistically significant difference between Group A and Group B.

Formula: Unpaired "t" test:

$$s = \sqrt{\frac{(n_1-1)s_1^2 + (n_2-1)s_2^2}{n_1+n_2-2}}$$

$$t = \frac{\left|\bar{x}_1 - \bar{x}_2\right|}{s\sqrt{{}^1/_{n_1} + {}^1/_{n_2}}}$$

n1 = total number of subjects in group A

n2 = total number of subjects in group B

x1= difference between pre test Vs. post test of group A

x1= mean difference between pre test Vs. post test of group A

x2= difference between pre test Vs. post test of group B

x2= mean difference between pre test Vs post test of group B

CHAPTER IV
DATA ANALYSIS & INTERPRETATION

4.1 DATA PRESENTATION

Table 1: Group 'A' step test pre and post study values

Subject Nos.	Pre Test HR value (bpm)	Post test HR value (bpm)
1	122	99
2	125	100
3	118	96
4	117	97
5	119	96
6	115	96
7	123	100
8	119	98
9	119	97
10	123	99
11	123	100
12	124	100
13	118	97
14	129	101
15	118	95
16	122	98
17	124	100
18	123	99
19	119	95
20	118	96

Table 2: Group ‘B’ step test pre and post study values

Subject Nos.	**Pre Test HR value (bpm)**	**Post test HR value (bpm)**
1	122	101
2	129	105
3	116	97
4	118	99
5	129	110
6	122	100
7	123	106
8	118	98
9	122	102
10	117	98
11	124	104
12	124	106
13	119	100
14	123	105
15	125	109
16	115	97
17	118	99
18	119	98
19	125	104
20	122	103

Table 3: Pretest of Step test

Group	Mean	Standard deviation	't'- value
A	120.9	3.315	0.4391
B	121.4	3.865	

The two-tailed P value equals 0.6630

Confidence interval:

The mean of Group One minus Group Two equals 0.50000

95% confidence interval of this difference: From -1.80494 to 2.80494

Table 4: Posttest of Step Test

Group	Mean	Standard deviation	't'- value
A	97.95	1.856	4.2873
B	102.05	3.853	

P value and statistical significance:

The two-tailed P value equals **0.0001**

By conventional criteria, this difference is considered to be extremely statistically significant.

Confidence interval:

The mean of Group One minus Group Two equals 4.10000

95% confidence interval of this difference: From 2.16406 to 6.03594

Table 5: Group "A" Pre test & post test values of Step Test

Group B	Mean	Standard deviation	't'- value	P value significance
Pre test	120.9	3.315	27.0150	0.0001**
Post test	97.95	1.856		

P value and statistical significance:

The two-tailed P value is less than 0.0001

By conventional criteria, this difference is considered to be extremely statistically significant.

Confidence interval:

The mean of Group One minus Group Two equals 22.95000

95% confidence interval of this difference: From 21.23022 to 24.66978

Intermediate values used in calculations:

t = 27.0150

df = 38

standard error of difference = 0.850

Graph 1: Group "A" Pre test & post test values of Step Test

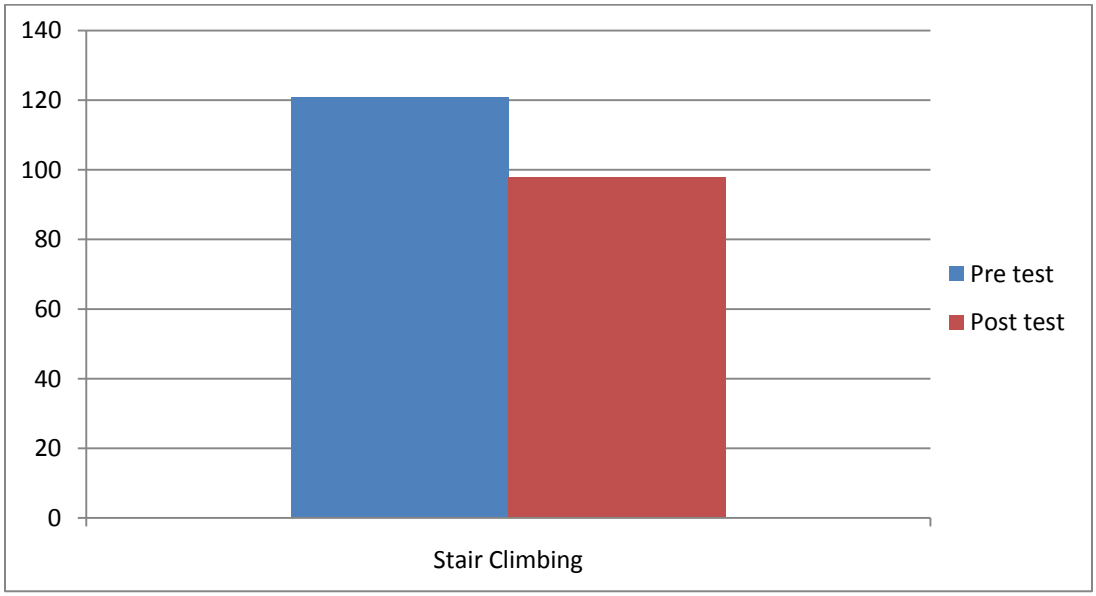


Table 6: Group "B" Pre test & post test values of Step Test

Group A	Mean	Standard deviation	't'- value	P value significance
Pre test	121.4	3.865	15.6925	0.0001**
Post test	102.25	3.853		

P value and statistical significance:

The two-tailed P value is less than 0.0001

By conventional criteria, this difference is considered to be extremely statistically significant. **

Confidence interval:

The mean of Group One minus Group Two equals 19.15000

95% confidence interval of this difference: From 16.67958 to 21.62042

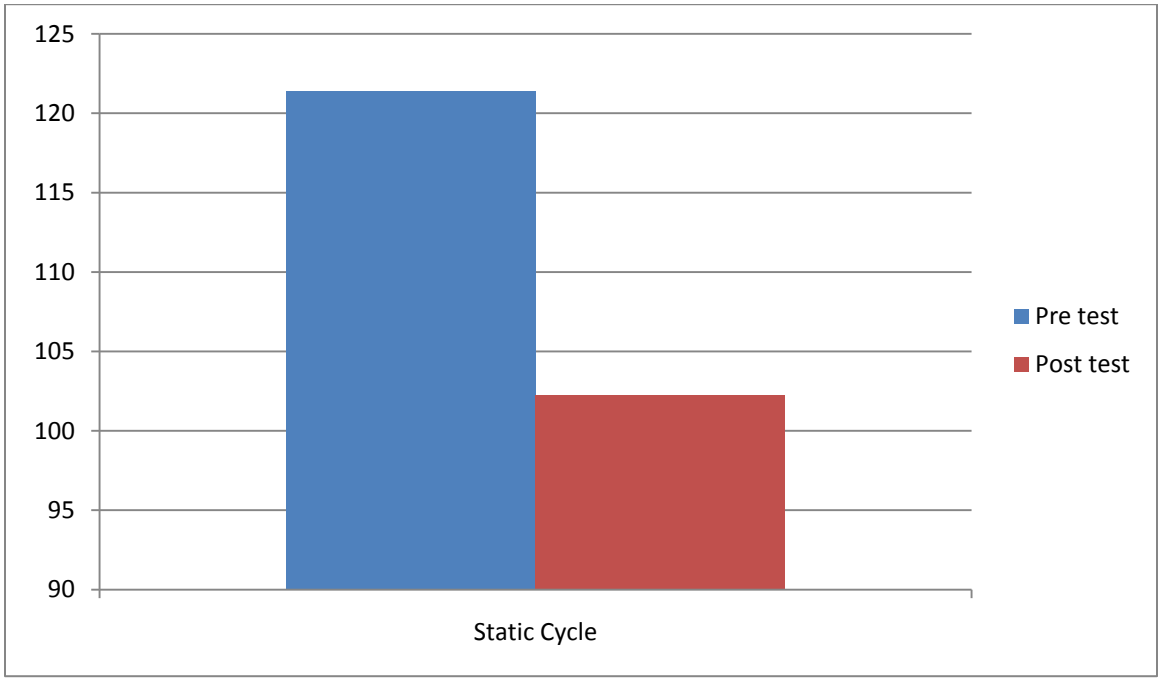
Intermediate values used in calculations:

t = 15.6925

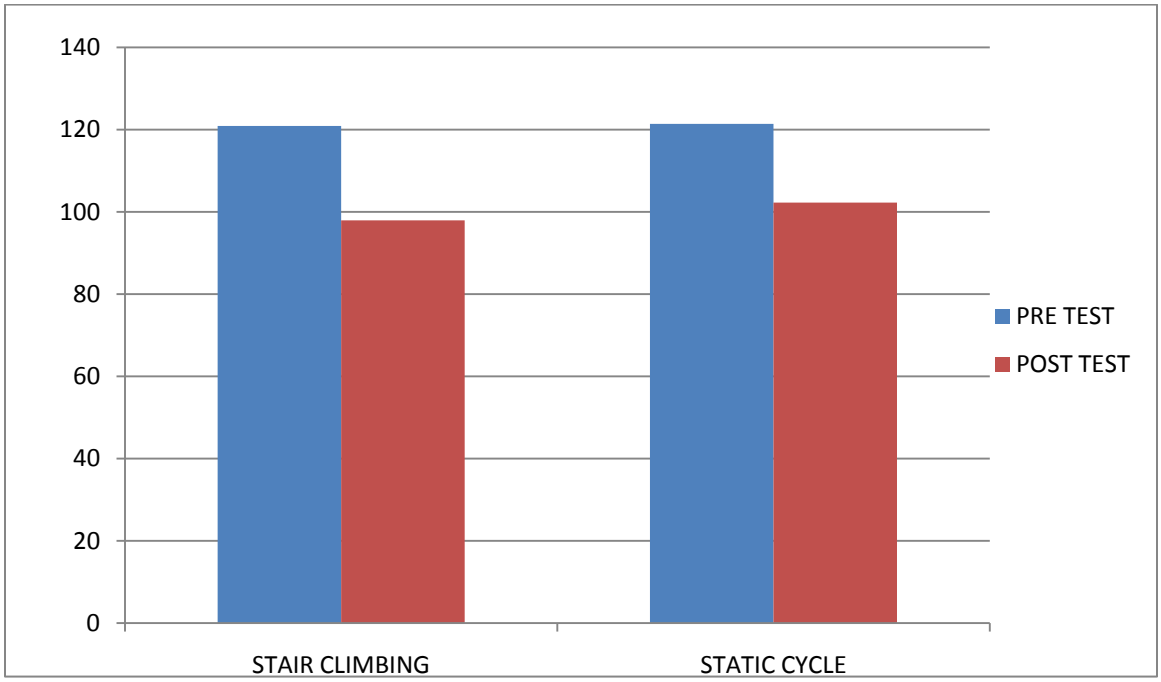
df = 38

standard error of difference = 1.220

Graph 2: Group "B" Pre test & post test values of Step Test



Graph 3: comparison of pre /post-test values in both the Groups



4.2 RESULTS

The mean and standard deviations of the two groups A and B have been shown in table 3 to 6.

Table 3 shows the pre test comparision of mean and standard deviations of the two groups A and B shows 't' value of 0.4391, the two-tailed P value equals 0.6630

Table 4 shows the post test comparision of mean and standard deviations of the two groups A and B shows 't' value of 4.2873, the two-tailed P value equals 0.0001** which was statistically significant

Group "A" Pre test & post test values of Step Test is tabulated in Table 5, which shows "t" value of 27.0150 and p value of 0.0001 which is statistically very significant

Group "B" Pre test & post test values of Step Test is tabulated in Table 6, which shows "t" value of 15.6925 and p value of 0.0001 which is statistically very significant

CHAPTER V
DISCUSSION

According to recent WHO report, globally around 23% of adults aged 18 and above (Men 20% and women 27%) is not active enough.[2] Various studies indicate that Stair Climbing and Static cycling exercise helps to improve on the Cardio respiratory fitness. Though these methods of training seem to be effective in altering the fitness levels, it has not been done with Indian house managers and the dominancy of one exercise over other is not established well.

The data collected suggest that many of the house managers are having less cardio respiratory fitness which is a source for serious health concern. The intervention of two different exercises were simple and time saving in terms of practical situation among house managers and promote the habit of exercise among them. The stair climbing is more advantageous in terms of cost effectiveness in addition to other benefits.

The results have supported the alternate hypothesis that both interventions are effective in altering the cardiac response to exercise. The stair climbing seems more effective in improving the fitness levels than that of the static cycling because it has a constant progression in terms of intensity in a gradual fashion, moreover it is stated that stair climbing has been shown to enhance muscle recruitment and improve cardiovascular capacity.[19]

It is found that the Stair-climbing exercise is used to increase the cardiovascular output.[21] when cardiac output is increased the stress on heart and the lungs is reduced, moreover the oxygen utilization on the skeletal muscles increase drastically in due course of the training program

The changes in the static cycling is more attributed to more muscle hypertrophy and improved skeletal muscle oxidative capacity and indices of cardio-metabolic health. There is an increase in the excitability of the intracortical inhibitory interneurons during the exercise and changes in the responsiveness of intracortical inhibitory interneurons following static cycling is documented.Though there is lot of evidences supporting both the interventions, the stair climbing seems to have a better effect statistically in altering the cardiac responses following the intervention

CHAPTER VI
CONCLUSION

It is proved that stair climbing exercises are effective in altering the cardio respiratory responses among house managers

It is proved that static cycling exercises are effective in altering the cardio respiratory responses among house managers

On comparison of the two types of exercises the stair climbing seems more effective over static cycling with a significant reduction in heart rate after step test.

From the above results, it can be rightly concluded that stair climbing and static cycling are both effective in altering the cardiac responses and stair climbing is more effective than static cycling in altering the cardiorespiratory responses among house managers.

CHAPTER VII
LIMITATION AND SUGESSTION

The results would have been more significant if the sample size was increased

Effect of exercise also depends on the duration of training; increased duration could have facilitated better results and long term effect

Further studies can be made with increased sample size and varying study populations

Additional benefits can be seen if various other interventions are clubbed to these

The limited studies in the concerned interventions further demands studies on this area

CHAPTER VIII

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CHAPTER IX

ANNEXURE

ANNEXURE – 1

INFORMED CONSENT FORM

TITLE: A comparative study on the effects of stair climbing exercises versus static cycling on cardio respiratory responses among house managers.

INVESTIGATOR: _ _ _ _ _ _ _ _ _ _ _

PURPOSE OF THE STUDY: I_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ ,have been informed that this study will work towards achieving on the functional activities of daily living in house managers.

PROCEDURE: Each term of the study protocol has been explained to me in detail. I understand that during the procedure, I will be receiving the treatment for one time a day. I understand that I will have to take this exercise for six weeks. I understand that this will be done under investigator, _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ supervision. I am aware also that I have to follow therapist‟s instructions as has been told to me.

CONFIDENTIALITY: I understand that medical information provided by this study will be confidential. If the data are used for publication in the medical literature or for teaching purposes, no names will be used and other literature such as audio or video tapes will be used only with permission.

RISK AND DISCOMFORT: I understand that there are no potential risks associated with this procedure, and understand that investigator will accompany me during this procedure. There are no known hazards associated with this procedure.

REFUSAL OR WITHDRAWL OF PARICIPATION: I understand that the decision my participation is wholly voluntary and I may refuse participate, may withdraw consent at any time during the study. I also understand that the investigator may terminate my participation in the study at any time after researcher has explained me the reasons to do so.

I _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ have explained to ……. the purpose of the research, the procedures required and the possible risks and benefits, to the best of my ability.

…… …… Investigator
Date

I ……. Confirm that researcher has explained me the purpose of the research, the study procedure and the possible risks and benefits that I may experience. I have read and I have understood this consent to participate as a subject in this research project.

…….. …… Subject
Date

…….. ……. Signature of the
Witness Date

ANNEXURE – II

ASSESSMENT PROFORMA

NAME :

AGE : DATE :

GENDER :

HEIGHT:

WEIGHT:

BMI:

BP:

HEART RATE (HR):

RESPIRATORY RATE (RR)

Step Test		
Heart Rate	Pre Test	Post Test
Heart Rate (Step Test)		

Signature of the physical therapist

YMCA STEP TEST REFERENCE RANGE FOR RESULT INTERPRETATION

Ratings for Women, Based on Age

	18-25	26-35	36-45	46-55	56-65	65+
Excellent	52-81	58-80	51-84	63-91	60-92	70-92
Good	85-93	85-92	89-96	95-101	97-103	96-101
Above Average	96-102	95-101	100-104	104-110	106-111	104-111
Average	104-110	104-110	107-112	113-118	113-118	116-121
Below Average	113-120	113-119	115-120	120-124	119-127	123-126
Poor	122-131	122-129	124-132	126-132	129-135	128-133
Very Poor	135-169	134-171	137-169	137-171	141-174	135-155

ANNEXURE 111

MASTER CHART

Group A						BP (mmhg)			
S.No	Subject Name	Age	BMI	HR	RR	Sys	Dia	Pre Test	Post Test
1	Ms. Suchithra	38	27	84	18	120	80	122	99
2	Ms.Aruna	36	26	86	16	110	78	125	100
3	Ms.Poongodi	39	25	84	17	124	85	118	96
4	Ms.Uma	44	27	84	17	125	85	117	97
5	Ms.Hepzi	42	30	80	16	120	80	119	96
6	Ms.Anitha	40	31	87	18	120	80	115	96
7	Ms.Geetha	45	29	78	14	124	86	123	100
8	Ms.Viji	39	26	78	14	126	85	119	98
9	Ms.Priya	37	25	85	18	124	85	119	97
10	Ms.Revathi	39	25	86	18	120	80	123	99
11	Ms.Romila	44	25	85	18	120	70	123	100
12	Ms.Emily	40	30	84	17	120	80	124	100
13	Ms.Anbarasi	38	30	72	14	126	85	118	97
14	Ms.Shapna	41	27	76	14	110	80	129	101
15	Ms.Daisy	36	26	79	14	120	80	118	95
16	Ms.Bency	38	25	80	17	120	80	122	98
17	Ms.Abrina	43	25	78	18	124	84	124	100
18	Ms.Teena	41	30	82	16	120	80	123	99
19	Ms.Banu	40	29	86	17	110	70	119	95
20	Ms.Jancy	38	30	84	18	115	80	118	96

MASTER CHART -2

Group B						BP (mmhg)			
S.No	**Subject Name**	**Age**	**BMI**	**HR**	**RR**	**Sys**	**Dia**	**Pre Test**	**Post Test**
1	Ms. Kalaivani	38	27	86	14	120	80	122	101
2	Ms.Anjali	40	29	84	16	125	84	129	105
3	Ms.Anitha	45	30	78	14	120	80	116	97
4	Ms.Divya	35	25	86	18	122	85	118	99
5	Ms.Dhanya	38	26	88	18	120	80	129	110
6	Ms.Kani Mozhi	38	27	80	18	120	80	122	100
7	Ms.Anni	36	26	72	16	126	85	123	106
8	Ms.Ranju	42	29	84	16	124	88	118	98
9	Ms.Anila	41	30	85	16	120	80	122	102
10	Ms.Jency	35	30	85	18	120	80	117	98
11	Ms.Jenita	41	25	86	18	120	80	124	104
12	Ms.Selvia	40	28	86	18	122	85	124	106
13	Ms.Daisy	36	28	85	18	122	84	119	100
14	Ms.Jasmin	39	28	78	16	120	80	123	105
15	Ms.Sujitha	35	26	78	17	120	80	125	109
16	Ms.Manjula	38	29	80	17	124	86	115	97
17	Ms.Kavitha	43	28	84	18	126	88	118	99
18	Ms.Sree lekha	45	30	84	17	120	80	119	98
19	Ms.Kavitha	42	29	86	18	120	80	125	104
20	Ms.Kiruba	40	28	86	18	120	80	122	103